INLET UNIT OF VACUUM CLEANER

BACKGROUND

1. Field of the Invention

The present invention relates to a vacuum cleaner, and more particularly, to an inlet unit for a vacuum cleaner, which is removably coupled to an inlet pipe of the vacuum cleaner.

2. Description of the Related Art

In a vacuum cleaner, for example, it is difficult to remove dust or foreign substance remaining at a corner of a chamber due to a structure of an inlet portion thereof. Recently, in order to solve the problem, there has been proposed a foldaway brush of the vacuum cleaner.

Fig. 1 to Fig. 4 shows a conventional foldaway brush of the vacuum cleaner. Referring to Figs. 1 to 4, the conventional foldaway brush for the vacuum cleaner is comprised of a center body 1 connected with an inlet pipe 105 (Fig. 5) of the vacuum cleaner, and a left and right body 2, 2' rotatably disposed at both sides of the center body 1, respectively. Between the center body 1 and the left and right body 2, 2', there is provided a spring 3 for returning the left and right body 2, 2' to its original position.

As shown in Fig. 3, the center body 1 has an inlet port 11 that is opened downwardly. External dust and dirt (hereinafter, called 'foreign substance') is sucked through the inlet port 11.

At both sides of an outer circumferential surface of the center body 1, there are formed guide grooves 12 for guiding each of the left and right bodies 2 and 2'. A spring guide hole 13 is formed at an upper side of the guide groove 12, and a spring 3 connected with the left and right bodies 2 and 2' is disposed in the spring guide hole 13.

At a lower surface of the center body 1, there are formed a first, second and third protrusion 14, 14', 14". The second and third protrusions 14' and 14" respectively have a side parallel to an inlet groove 21, 21'. At a lower center side between the second protrusion 14' and the third protrusion 14", there is provided the first protrusion 14. Further, at the lower surface of the center body 1, there are formed a pair of block guide grooves 17 and 17' formed at an outside of the protrusions 14, 14' and 14" in a circumferential direction.

Meanwhile, the left and right body 2, 2' is provided with a protruded guide 22, 22' coupled to the guide groove 12. At an upper side of the protruded guide 22, 22', there is provided a spring connecting hole 24, 24' in which the spring 3 is inserted. At a lower side of the protruded guide 22, 22', there is form the inlet groove 21, 21' for guiding the external foreign substance to the inlet port 11 of the center body 1. And at the lower side of the protruded guide 22, 22', there is disposed a block 23, 23' for preventing loss of suction force between the center body 1 and the left and right body 2, 2'.

And block guides 25, 25' are formed on an upper surface of the block 23, 23'. The block guides 25, 25' are coupled to a block guide groove 17, 17' formed in the lower surface of the

center body 1. Herein, the block guide grooves 17 and 17' respectively have a different diameter with respect to a center axis of the center body 1. Thus, the blocks 23 and 23' of the left and right bodies 2 and 2' can be smoothly rotated without any contact with each other.

Furthermore, the spring 3 is a torsion spring. One end of the spring 3 is fixed to the center body 1, and the other end is inserted into the spring connecting hole 24, 24' of the left and right body 2, 2'. For example, in case the left and right body 2, 2' is rotated by furniture or a wall in a room, the spring 3 functions to provide a restoring force.

The conventional brush of the vacuum cleaner can be coupled to the inlet pipe of the vacuum cleaner using a connector (not shown) which is proper to a shape of the center body 1. For example, when cleaning a corner of the room, which has an angle of 90°, using the foldaway brush coupled to the vacuum cleaner, the brush can be moved forward as shown in Fig. 4. Then, the left and right bodies 2, 2' are rotated with the center body in the center by an external force. Thus, the inlet port 11 of the center body 1 approaches the corner between a bottom 51 and a wall 44. At this time, the foreign substance is sucked in an arrow direction. When the brush is moved backward after completion of the cleaning operation at a desired portion of the room, the external force applied to the left and right bodies 2, 2' is removed. Therefore, the left and right bodies 2, 2' are returned to the original position by the restoring force of the spring 3.

As described above, the conventional foldaway brush for the vacuum cleaner has an advantage that is capable of cleaning the corner of the room. However, since a length of the left

and right body is limited, the cleaning operation can be performed at only a comparative narrow area. Therefore, there is an inconvenience that the user has to repeatedly move the brush when performing the cleaning operation. Further, in the conventional foldaway brush for the vacuum cleaner, due to its structure that the spring is disposed to be exposed to the inlet port through which the foreign substance is sucked, the foreign substance may be held between the spring 3 and the spring guide hole 13, thereby causing an operation defect. Further, it is difficult to remove the foreign substance from the spring.

SUMMARY

Therefore, it is an object of the present invention to provide an inlet unit of a vacuum cleaner, in which a suction area can be facilely expanded and contracted according to an included angle or a surface area of a corner of a room, thereby easily performing a cleaning operation.

It is another object of the present invention to provide an inlet unit of a vacuum cleaner, in which a rotation of a left and right body can be smoothly rotated with a center body in the center, particularly, which can prevent many problems that may be generated by sucked foreign substance held or fixed therein.

To achieve an object of the present invention, there is provided an inlet unit of a vacuum cleaner, comprising an inlet body having a dust inlet port and removably coupled to an inlet pipe of the vacuum cleaner; and an auxiliary inlet body coupled extendably and contractibly to the inlet

body so as to variably cope with a corner having a desired angle, and having an auxiliary inlet port communicated with the dust inlet port in an extending and contracting direction.

Preferably, the auxiliary inlet body comprises a pair of rotational brushes rotatably coupled to the dust inlet port of the inlet body, and an extension brush that is extendable and contractible in a length direction of the rotational brush, and the auxiliary inlet port is formed along both bottom surfaces of the rotational brush and the extension brush in a length direction thereof.

Further, the inlet body comprises a center body formed with a dust inlet port that is opened downwardly and a dust outlet port directed to the inlet pipe and having a hinge rib extended downwardly from the dust inlet port so as to allow the rotational brush to be rotated left and right, and a main casing in which the center body and the inlet pipe are disposed, for rotatably supporting the rotational brush.

Preferably, the main casing comprises a center portion having an air path between a body mounting portion in which the center body is mounted and a pipe coupling portion communicated with the inlet pipe; and a pair of wing portions respectively extended from the center portion to both sides and respectively having a rotation guiding portion for guiding a rotation of the rotational brush.

Preferably, the inlet unit further comprises an elastic member for returning the rotational brush to an original position.

Further, the rotational brush comprises a hinge portion rotatably coupled to the hinge rib of the center body, and a rotational body in which the extension brush is extendably and contractibly received and the auxiliary inlet port is protruded on a bottom surface thereof and which is rotated with the hinge portion in a center.

Therefore, a suction area of the inlet unit can be facilely expanded and contracted according to an included angle or a surface area of a corner of a room, thereby easily performing a cleaning operation. Further, since a rotation of a left and right body can be smoothly rotated with a center body in the center, and particularly, the sucked foreign substance is not held with or fixed to the inlet portion, an operation detect is remarkably reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

Fig. 1 is a perspective view of a conventional inlet unit;

Fig. 2 is a lower view of Fig. 1;

Fig. 3 is an enlarged perspective view of a center body of Fig. 1;

Fig. 4 is a view showing an operation of the conventional inlet unit;

Fig. 5 is a perspective view of a vacuum cleaner with an inlet unit according to the

present invention;

Fig. 6 is an enlarged view of a main part of Fig. 5, showing the inlet unit according to the present invention;

Fig. 7 is an exploded perspective view of Fig. 6;

Fig. 8 is a lower perspective view of Fig. 7;

Fig. 9 is a partially enlarged perspective view of Fig. 8, showing a center body, an auxiliary inlet body and a hinge cover;

Fig. 10 is an assembled perspective view of Fig. 9;

Fig. 11 is an enlarged perspective view showing a coupled state of the auxiliary inlet body of Fig. 7;

Fig. 12 is a cross-sectional view taken along a line I-I of Fig. 11;

Fig. 13 is a cross-sectional view taken along a line II-II of Fig. 11; and

Fig. 14 is a perspective view showing an operation of the inlet unit in a status that an upper cover is removed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, a height adjusting apparatus for a suction brush of an upright vacuum cleaner according to a preferred embodiment of the present invention will be described in detail with reference to the annexed drawings.

Fig. 5 is a perspective view of a vacuum cleaner with an inlet unit according to the present invention. As shown in Fig. 5, a vacuum cleaner 100 is comprised of a cleaner body 101 in which a vacuum generating unit (not shown) is mounted, an inlet pipe assembly 102 coupled to the cleaner body 101 and an inlet unit 110 coupled to the inlet pipe assembly 102 so as to suck foreign substance from an outside. The inlet pipe assembly 102 comprises a flexible pipe 104 coupled to an inlet port 106 of the cleaner body 101, an inlet pipe 105 coupled to a rear portion of the inlet unit 110 and an handle pipe 105 interposed between the flexible pipe 104 and the inlet pipe 105.

Fig. 6 is an enlarged view of a main part of Fig. 5, showing the inlet unit according to the present invention, and Fig. 7 is an exploded perspective view of Fig. 6, and Fig. 8 is a lower perspective view of Fig. 7. The inlet unit 110 includes an inlet main body 120 coupled to the inlet pipe 105 of the vacuum cleaner 100, and an auxiliary inlet body 150 which is expandable/contractible and simultaneously rotatable with respect to the inlet main body 120. The inlet main body 120 is connected via a first connecting pipe 116 and a second connecting pipe 117 to the inlet pipe 105. The first and second connecting pipes 116 and 117 are connected with each other so as to be relatively rotated.

The inlet main body 120 is provided with a main casing 121 and a center body 141 disposed in the main casing 121. As shown in Figs. 9 and 10, the center body 141 is provided with a hinge rib 143 forming a rotational shaft of the auxiliary inlet body 150, and a dust outlet

port 142 opened in a rear direction thereof. The hinge rib 143 is formed with a dust inlet port 146 opened downwardly. An air passing portion 145 is formed at an outer surface of the hinge rib 143.

The main casing 121 is comprised of a lower case 123 and an upper cover 122. The lower case 123 is formed with a center portion 131 in which the center body 141 is disposed, and a pair of wing portions 124 and 124' that are extended from both sides of the center portion 131. In the center portion 131, there is formed an air path 134 in a front-rear direction. At a front end of the air path 134, there is formed a body mounting portion 132 in which the center body 141 is disposed, and at a rear end thereof, there is formed a pipe coupling portion 133 in which the second connecting pipe 117 is coupled. Therefore, the foreign substance discharged to the dust outlet portion 142 of the center body 141 is flowed along the air path 134, and then introduced through the second connecting pipe 117 into the inlet pipe 105.

Inclined surfaces 126, 126' that are inclined at a desired angle in a rear direction are formed at the wing portion 124, 124' of the lower case 123. At a center area of a bottom surface of the wing portion 124, 124', there are formed a guide groove 125, 125' forming an arc with the hinge rib 143 of the center body 141 in the center. Guide protrusions 166, 166' protruded upward on a rotational brush 161, 161' of the auxiliary inlet body 150 are received in the guide groove 125, 125'. The guide protrusions 166, 166' guide a rotation of the rotational brush 161, 161', while moving along the guide groove 125, 125'. At this time, the inclined surfaces 126, 126' function

to restrict an excessive rotation of the rotational brush 161, 161', when the rotational brushes 161, 161' are contacted with, for example, a wall of a room or furniture, etc.

Spring protrusions 127, 127' are formed on the bottom surface of the wing portion 124, 124' of the lower case 123 to be protruded upward. Preferably, the spring protrusions 127, 127' are formed between the guide groove 125, 125' and the hinge rib 143. Torsion springs 135, 135' are inserted onto the spring protrusion 127, 127'. Each of the torsion springs 135, 135' is fixed to the wing portion 124, 124' at one end, while fixed by the other end to each guide protrusion 166, 166' formed on the rotational brushes 161, 161'. Therefore, the rotational brushes 161, 161' rotatably supported by the wing portion 124, 124' can be returned to an original position thereof by an elastic force of the torsion spring 135, 135', as described below.

Fig. 11 is an enlarged perspective view showing a coupled state of the auxiliary inlet body of Fig. 7, and Fig. 12 is a cross-sectional view taken along a line I-I of Fig. 11, and Fig. 13 is a cross-sectional view taken along a line II-II of Fig. 11. The auxiliary inlet body 150 is provided with a pair of rotational brush 161, 161' and a pair of extension brush 171, 171' that is extendably and contractibly received in the rotational brush 161, 161'. In the drawings, only the rotational brush 161 and the extension brush 171 are shown, and hereinafter, it will be described centering on them

The rotational brush 161 is comprised of a hinge portion 163 coupled to the hinge rib 143 of the center body 141, and a rotational body 162 extended from the hinge portion 163 in a radial

direction. The rotational body 162 is in the form of a rectangular box, and has an opening 167 at an end opposite to the hinge portion 163. In a bottom surface of the rotational body 162, there is formed an auxiliary inlet port 168 that is protruded upward. The auxiliary inlet port 168 is extended along a length of the rotational body 162, and one end of the auxiliary inlet port 168 is communicated with the dust inlet port 146 of the center body 141. The guide protrusion 166 (referring to Fig. 7) is protruded upward on an upper surface of the rotational body 162 so as to be inserted into guide groove 125 formed in the wing portion 124 of the main casing 121.

Meanwhile, the hinge portion 163 is in the form of a ring, and rotatably coupled to an outer surface of the hinge rib 143. The hinge portion 163 is formed at an upper portion of an end of the rotational body 162 so as to have a thickness corresponding to the half of a height of the rotational body 162. And the hinge portion 163' of another rotational brush 161' is formed at a lower portion of an end of the corresponding rotational body 162'. Therefore, as shown in Fig. 10, the hinge portions 163 and 163' are overlapped on the outer surface of the hinge rib 143.

In addition, the hinge portion 163' of the rotational brush 161', which is disposed at a lower side of the other hinge portion 163, is formed with a dust passing portion 165 on an outer surface thereof. The dust passing portion 165 serves to communicate the auxiliary inlet port 168 of the rotational brush 161 with the dust inlet port 146 of the center body 141.

As shown in Fig. 10, the hinge portions 163, 163', which are overlapped with each other on the outer surface of the hinge rib 143 of the center body 141, are supported by a hinge cover

181 coupled to the hinge rib 143 at a lower side thereof. A hook 182 is formed at an upper end of the hinge cover 181, and a hook slot 144 in which the hook 182 is coupled is formed at the hinge rib 143. And since an air passing portion 185 is also formed at an outer surface of the hinge cover 181, the auxiliary inlet port 168, 168' and the dust inlet port 146 are communicated with each other.

Meanwhile, the extension brush 171 is also in the form of a rectangular box, and received in the opening 167 of the rotational brush 161. In a bottom surface of the extension brush 171, there is also an auxiliary inlet port 178. The auxiliary inlet port 168 of the rotational brush 161 32 is engaged with the auxiliary inlet port 178 of the extension brush 171. Therefore, the extension brush 171 can be slid in the length direction of the rotational brush 161 to be extended or contracted. The auxiliary inlet port 178 of the extension brush 171 is directly communicated with the dust inlet port 146 of the center body 141 in a contracted state, and communicated through the auxiliary inlet port 168 of the rotational brush 161 with the dust inlet port 146 in an extended state.

A latching rib 177 that is protruded to the outside is formed at an outer end of the extension brush 171. The latching rib 177 is contacted with an open surface of the rotational brush 161, when the extension brush 171 is contracted in the rotational brush 161. Therefore, it is prevented that the extension brush 171 is excessively contracted.

As shown in Fig. 11, the extension brush 171 can be fixed to a desired position with respect to the rotational brush 161 by a leaf spring 191 and a plurality of latching jaws 192. The

leaf spring 191 is fixed to a spring groove 193 formed in an outer surface of the extension brush 171. The plurality of latching jaws 192 are formed to be protruded inward along the length of the rotational brush 161. The leaf spring 191 is engaged with the latching jaws 192 of the rotational brush 161, when the extension brush 171 is extended or contracted. Herein, the leaf spring 191 may be provided at the rotational brush 161, and the latching jaws 192 may be provide at the extension brush 171.

On the upper surface of the extension brush 171, there is formed a moving protrusion 196, and on the upper surface of the rotational brush 161, there is formed a moving guide 195 in the length direction of the rotational brush 161. The moving protrusion 196 is received in the moving guide 195 and moved in the length direction of the rotational brush 161. Thus, the extension brush 171 can be smoothly slid to be extended or contracted with respect to the rotational brush 161. Herein, the moving protrusion 196 may be provided on the rotational brush 161, and the moving guide 195 may be formed on the extension brush 171.

In order to assemble the inlet unit 110 as described above, firstly, the center body 141 is disposed at the lower case 123 of the main casing 121. Then, the hinge portions 163 and 163' formed at the rotational brushes 161 and 161' are coupled to the hinge rib 143 of the center body 141 in a status that the hinge portions 163 and 163' are overlapped with each other. At this time, if an external force is applied upward from a lower side of the hinge portion 163, 163', the guide protrusion 166, 166' formed on the rotational brush 161, 161' can be received in the guide groove

125, 125' formed at the wing portion 124, 124' of the lower case 123.

In this situation, the hinge cover 181 is coupled to the hinge rib 143 of the center body 141. Then, the rotational brushes 161, 161' are supported by the hinge cover 181 and the wing portion 124, 124' of the lower case 123 so as to be rotatable in a left or right direction with the hinge rib 143 in the center. The torsion springs 135, 135' are coupled to the spring protrusion 127, 127' of the lower case 123, and then, both ends of the torsion spring 135, 135' are respectively fixed to the bottom surface of the lower case 123 and the guide protrusion 166, 166' of the rotational brush 161, 161'. At this time, both rotational brushes 161 and 161' are disposed to be opposite to each other with the hinge rib 143 in the center by the elastic restoring force of the torsion spring 135, 135'.

Then, the extension brushes 171, 171' are coupled to the rotational brush 161, 161'. And at the same time or at another time, the second connecting pipe 117 connected with the first connecting pipe 116 is coupled to the pipe coupling portion 133 of the lower case 123. If the upper cover 122 is coupled to an upper portion of the lower case 123, the assembling process of the inlet unit 110 is completed.

In this situation, the first connecting pipe 116 can be coupled to the inlet pipe 105 of the vacuum cleaner 100. Then, the vacuum cleaner is turned on, and as shown in Fig. 14, the corner of the room can be cleaned. That is, if the inlet unit 110 is pressed forward in a status that is disposed to be adjacent to both sidewalls 55, the rotational brushes 161, 161' are rotated by the

walls 55. The extension brushes 171, 171' received in the rotational brushes 161, 161' can be properly extended so as to increase a cleaning area.

Meanwhile, the rotational brushes 161, 161' that are rotated with the hinge rib 143 of the center body 141 in the center are rotated no longer, when being contacted with a corner of both walls 55. Then, if the external force applied to the rotational brushes 161, 161', the rotational brushes 161, 161' are returned to the original position by the elastic force of the torsion spring.

While the present invention has been described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.